HIGHWAY COSTS AND REVENUES IN CANADA:
A FURTHER COMMENT*

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Recent papers by Dalvi[1] and Conklin *et al.*[2] have raised questions on the nature and effects of road finances in Canada. This comment evaluates these papers,

and presents in summary form an alternative conceptual framework and preliminary results of statistical work utilizing this framework.

Dalvi's intention was to examine the highway revenues and costs from an industry point of view. Conklin *et al.* accepted Dalvi's estimate of costs within an industry framework but they rejected his revenues. They proceeded to derive the revenues in a general equilibrium framework. This is an error of inconsistency. There would be no objection to their intended general equilibrium approach if it were applied to both costs and revenues. Since they decided to include sales taxes and import duties on the revenues side, for consistency they must also include on the cost side the costs of the misallocation of resources due to these taxes, plus the cost of administering these taxes.[3]

Additionally Conklin *et al.* omitted to incorporate in their framework the increase in government revenues that would have occurred if the expenditures on motor vehicles would have shifted to other items. For example on the question of misallocation of resources between rail and road, the taxation revenues that constitute receipts from highway users according to Conklin *et al.* is "the amount by which government revenues are decreased by a shift from highway usage to railroad usage. In a general equilibrium model, this amount is not only the taxation paid directly by highway users solely because of the fact that they are highway users but also all taxes paid due to the second-order effects the highway system has on the economy".[4] It is suggested by the latter statement that if a shift takes place from highway use to rail, government revenues will decrease, the amount of decrease being equal to the decrease in direct highway user charges plus the decrease in taxes due to highway second order effects. They failed to notice that the taxes paid due to the rail secondary effects will increase because of the increase in rail use. The direction and magnitude of the change in government revenues therefore, is a function not only of the highway taxation and its second-order effects but those of the rail as well.

In the empirical part of their comment Conklin *et al.* then go on to change Dalvi's revenue estimates by including import duties, and sales and excise taxes, attributable to automobiles, citing Prest[5] as an authority. It seems to me that Conklin *et al.* have sadly misread Prest's article on two counts. First, Prest is using an industry framework rather than a general equilibrium one. Second, Prest uses a different revenue figure in his revenue-cost comparison than the one stated by Conklin *et al.* (as well as by Dalvi). In section I of his article Prest estimated revenues as £739 million but in section III he modified his revenue figure, "it is surely not legitimate to treat the whole of the £720m collected in petrol and vehicle duties as being available for covering the costs of road pro-

[3]For example for the year 1954 the revenue from import duties of parts and vehicles was estimated to be 33 million dollars (*Royal Commission on the Automotive Industry* (Ottawa, 1961), p. 107). The total cash cost of the tariff for the automotive industry was estimated for 1954 to be $72–105m. (*Canadian Commercial Policy, Royal Commission on Canada's Economic Prospects* (Nov. 1957), 72 and 186). The cost of administering the customs should be also added to these costs. This is a clear case where the revenues are much lower than the costs as a result of the import duties. Thus the conclusion reached by Conklin *et al.* are reversed when a consistent framework is used.

[4]Conklin *et al.*, "Highway Costs," 603.

[5]A. R. Prest, "Some Aspects of Road Finance in the UK," *The Manchester School*, 31 (Sept. 1963), 223.

vision."[6] He attributed £185 million to indirect taxes which he deducted from the total before comparing revenues and costs.

On the question of the indirect taxes and whether they constitute a highway revenue I agree with Prest: "In so far as the Government raises revenue for its general purposes by indirect taxes on different goods and services, the road sector should clearly pay its share."[7] Any taxes that are uniformly applied to all goods including the road vehicles and parts should be excluded from the revenue side of the highway industry.

In this paper the "industry" framework was adopted. Annual revenues were computed as the sum of vehicle fuel charges, license fees, tolls, drivers' and chauffeurs' license fees, fines for infraction of the Motor Vehicle Act, transfer of ownership fees, replacement of license fees, and road parking revenues. On the cost side I generally agree with the basic framework followed by Dalvi. Nevertheless, there are some errors in his method of estimation of costs and revenues.[8] In the engineering literature[9] the road life is discussed in terms of the life of each road element, such as life of surfaces, earth-works, structures, etc. My conclusion is that a road life of 15–20 years should be used.[10] With reference to the rate of return, if the highway were examined in an industry framework which would imply some risk of capital involved, the expected rate of return would be between 11 to 15 per cent. Prest took this into account and he used a rate of return of 10.4 per cent.[11] In the road/rail co-ordination problem care must be taken that the rates used reflect the risk of capital in each mode. As the railway rate of return is 10 to 12 per cent the appropriate rate of return for roads might be of the same order. Another rate of return which might be appropriate is the annual provincial bond rate, which has generally been under 8 per cent. It may be argued that since the highways are built by the provinces, the proper rate of return is the cost of funds to the provincial governments. This rate of return largely excludes the element of industrial risk and may result in an underestimate of costs.

Utilizing the above framework, data were obtained from the DBS and suitably modified. The costs of traffic control (traffic lights, municipal and provincial police, and justice costs for traffic) and road parking were estimated and included in the annual costs. It was estimated that 54 per cent of administration costs are for construction and 46 per cent for maintenance and they were allocated accordingly. The "joint costs" such as right of way, snow removal and road cleaning were estimated and allocated appropriately to users and non-users.

[6]*Ibid.*, 235.
[7]*Ibid.*
[8]There are some inconsistencies in Dalvi's empirical approach which may not significantly alter his final results, but they alter significantly the relative magnitudes of the road components, as shown in Table I. (i) He deducted from the DBS revenue data the commission paid by the provinces to the fuel firms for the collection of fuel taxes, although the DBS data are already net of these charges; (ii) he added the right of way cost to the DBS data, although it was already included; (iii) the right of way was depreciated although his intention initially was not to do so; (iv) the computation of the depreciation whereby the net road stock is divided by the road life is incorrect; (v) no attempt was made to estimate and allocate the "joint costs."
[9]R. Winfrey, *Economic Analysis for Highways* (Scranton, Pennsylvania, 1969), 224.
[10]In Canada surfaced highways are designed with a twenty-year life.
[11]Prest, "Some Aspects of Road Finance," 233 (240/2300 = 10.4 per cent).

TABLE I[1]

1968 ROAD COSTS AND REVENUES ALLOCATED TO VEHICLES (in millions of 1968 constant dollars).
(Road life: 20 years; method of depreciation: declining balance; rate of return: annual provincial average bond rate, 1926–48)

Region	Road stock			Annual road cost							Annual revenue	Annual subsidy (cost-revenue)	Subsidy as percentage of cost
	Gross capital stock	Net capital stock	Right of way stock	Real capital depreciation	Opportunity cost of capital (interest)	Opportunity cost of right of way	Total capital cost	Maintenance	Licensing and control	Grand total cost			
Canada	13128	7137	1057	765	368	67	1200	520	138	1858	1347	511	28
Nfld.	334	204	23	21	11	2	33	15	2	50	24	26	52
PEI	111	61	9	6	3	1	10	4	1	15	6	8	57
NS	471	237	42	27	12	3	42	21	6	68	45	24	35
NB	469	245	44	27	13	3	43	20	4	67	35	32	48
Quebec	3160	1736	252	187	90	16	293	135	32	460	372	88	19
Ont.	4303	2414	359	256	124	23	403	181	52	636	520	116	18
Manitoba	623	330	46	35	17	3	55	19	7	81	56	25	30
Sask.	743	436	59	46	23	4	73	24	7	104	62	42	40
Alta.	1261	634	97	69	32	6	108	37	13	157	96	62	39
BC	1532	775	116	84	39	7	130	53	15	198	128	71	36
Yukon and NWT	113	64	8	7	3	*	11	10	*	21	3	18	84

[1]The totals in this table may not tally because some of the federal expenditures for Trans-Canada Highway and for grade separation for road/rail crossings are included in "Canada" but not in the provincial figures; also because of rounding.
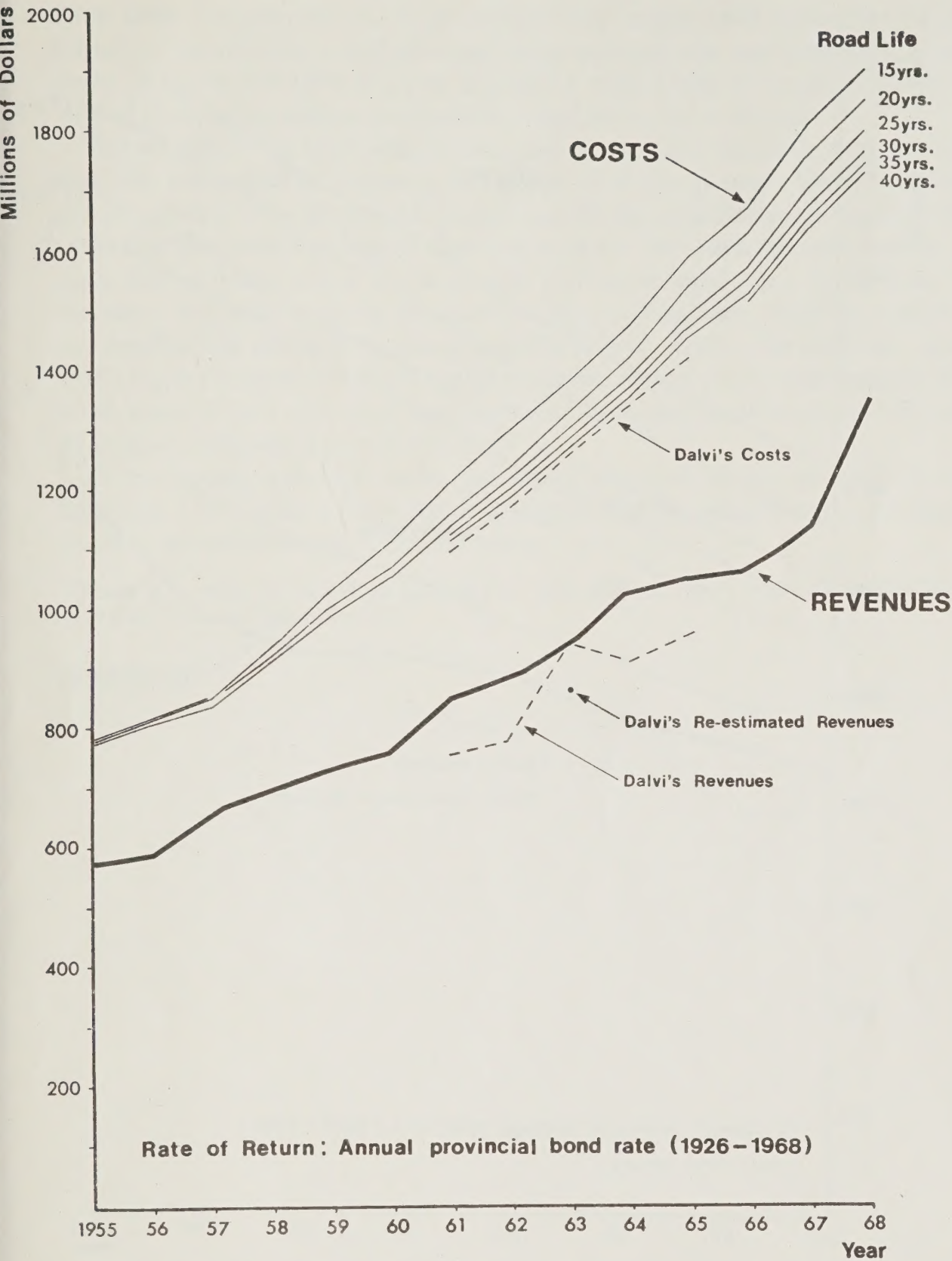
*Less then 0·5.

FIGURE 1. Canada: total annual road revenues and costs allocated to vehicles for different road-life assumptions (in millions of 1968 constant dollars).

The cost of sidewalks, included in the DBS data, was totally allocated to non-users. Since the right of way does not depreciate, its only annual cost is the rent on the right of way. The total annual cost to be allocated to the vehicles is the sum of the following: annual real capital depreciation, opportunity cost of capital, rent on right of way, maintenance and operations,[12] police and justice

[12] Costs of traffic signals and signs, road cleaning, and snow removal have been included.
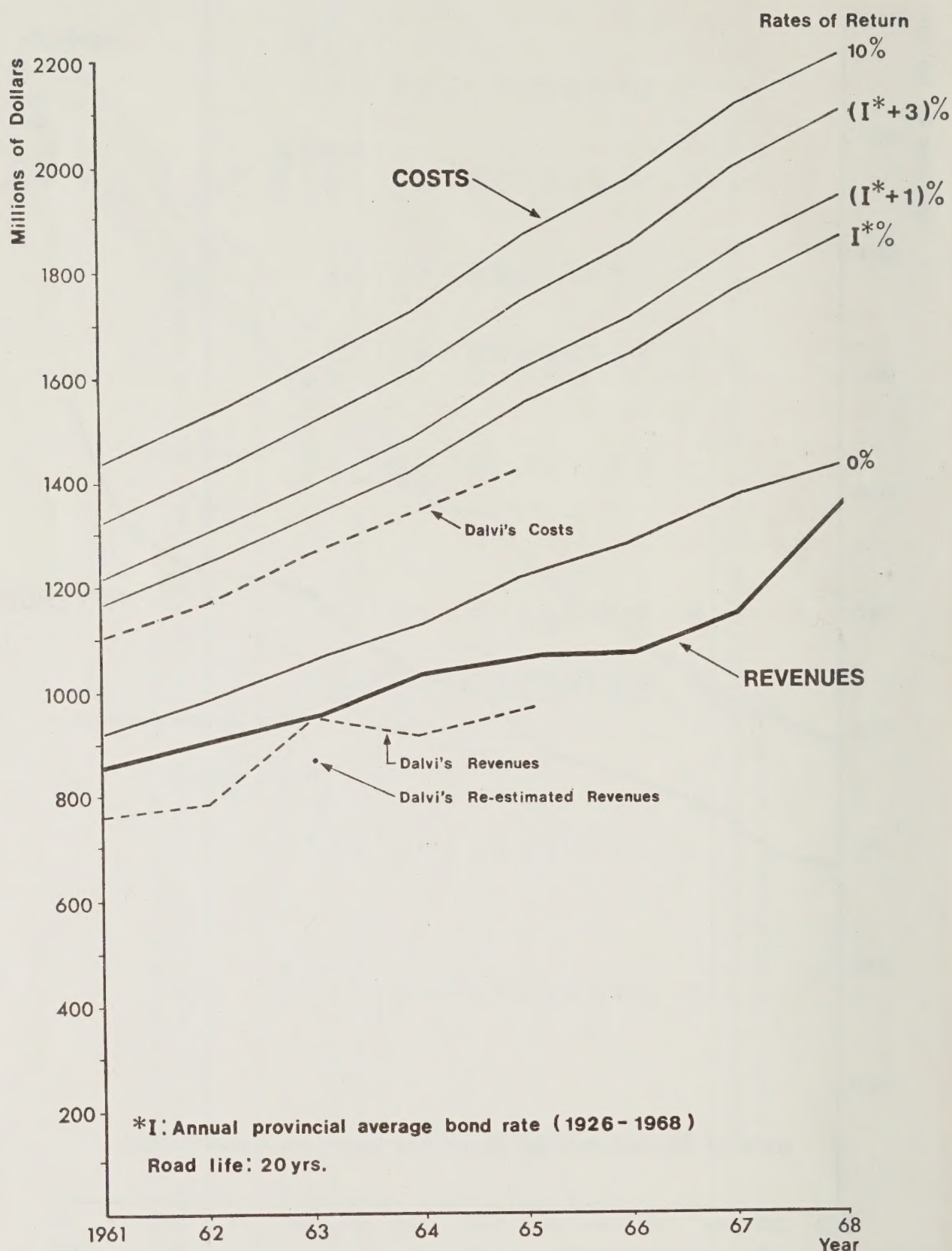
FIGURE 2. Canada: total annual road revenues and costs allocated to vehicles for different rates of return.

traffic control costs, and all other administrative costs of licensing and transfer of vehicle ownerships.

The revenues and costs of other items such as vehicles, accidents, pollution, and congestion were excluded from this framework. In addition, care was taken to ensure that there is a correspondence between revenues and costs. The annual costs and revenues were computed for Canada and all provinces for years 1955–

68 in 1968 constant dollars. Price indices were constructed separately for construction, maintenance, and administration expenditures and revenues. A summary of results for 1968 is given in Table I with a rate of return equal to the annual provincial average bond rate and road life equal to 20 years.

The sensitivity of total annual costs and revenues to varying assumptions of road life was tested in Figure 1. For purposes of comparison, Dalvi's estimates are also plotted after they were revised to 1968 constant dollars.[13] Figure 1 indicates that the costs are higher than revenues for any road life assumption and for a rate of return equal to the annual provincial bond rate. As the road life increased the costs cease to be sensitive. Figure 2 indicates that the road costs are significantly sensitive to changes in the rate of return. The costs are consistently higher than the revenues for any positive rate of return and for a road life of 20 years. It was estimated that costs and revenues break even in 1968 for a 25-year road life and zero rate of return.

In conclusion, although more research is required in the question of road financing, I feel there is fairly strong evidence that the vehicle road costs are not met by road user charges in Canada today.

[13]There is an error in Dalvi's computation of 1963 revenue which was re-estimated by the author as shown in Figures 1 and 2.